

Zero Retries issue 0125 2023-11-17

Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1000+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0125>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

I'm still "new" at this publishing stuff and especially regarding paid subscriptions. One of the (newer?) features of a paid subscription on Substack is that a paid subscriber can add a message as part of their paid subscription. Those messages can be private, or public (shareable), and I haven't been good at publicly acknowledging those who chose to provide a public message. I'm now correcting that.

(Originally acknowledged in Zero Retries 0106.)

My thanks to Paid Subscriber **Florian Lengyel WM2D**. WM2D offered this public message:

A challenging read. Lack of commercials. Seems like a balanced presentation.
Exposure to new (to me) areas of radio.

In correspondence with WM2D, he offered an additional comment:

Zero Retries is easily the best of the amateur radio newsletters I've read since I became a ham in 1988.

...

(Originally acknowledged in Zero Retries 0124, now updated.)

My thanks to Paid Subscriber **Edward Mitchell KF7VY**. KF7VY is an old friend who formerly published the excellent Ham Radio Online blog which concluded after a nice run of twelve years. I learned a heckuva lot from HRO. KF7VY offered this public message:

I've known Steve for a long time. He writes well about an important subject for amateur radio. Happy to support his work.

New Paid Subscribers Support Zero Retries

My thanks to new Paid Subscriber **Eric Guth 4Z1UG** (QSO Today Podcast www.qsotoday.com) who offered this public message:

I am very interested in the evolution of amateur radio and its future. It has a huge impact on civilization and I am proud to be a part of it.

...

My thanks to new Paid Subscriber **Jon Pearce WB2MNF** (President, Gloucester County (NJ) ARC) who offered this public message:

Great ideas for supporting development of amateur radio amongst an ever-aging group of hams. We need new technologies to attract different groups of technically-minded hams.

...

My thanks to new Paid Subscriber **Jason Rausch ~~KE4NV~~ K4APR** (Owner / Lead Engineer / Shipper / Janitor at RPC Electronics, LLC by Night) who offered this public message:

I know Steve and he has supported my company with articles. It's VERY much appreciated!

...

My thanks to new Paid Subscriber **Josh Walton KK4LGZ** who offered this public message:

I get so excited when I see you have posted! Love your work, your style, and the subjects you cover. Keep up the great work and keep me excited every time you post!

Thank you 4Z1UG, WB2MNF, KE4NV, and KK4LGZ - financial support is a real vote of confidence for continuing to publish Zero Retries.

This issue is a rare single topic issue - see below. It just kind of consumed the week, my thoughts, and my available time for writing Zero Retries. Even this one topic, almost entirely text, caused the ***Post too long for email*** flag to appear in the Substack editor. I feel that it's important to get my thoughts out early, on this issue, as detailed as I could be given the publishing time (which, even then, I missed - apologies, yet again) as there will be a *lot* of heat and noise expended in the coming weeks in commenting on this subject. (Several YouTube channels are already "on it" in creating heat and noise with their fast analysis.)

It's my hope that my in-depth thoughts about the background of the subject, and my proposed recommendations, will serve you Zero Retries readers well in *your considerations* about the changes that are already in progress for the US Amateur Radio HF bands, and the changes to be proposed for the US Amateur Radio VHF and UHF bands.

I will continue to cover this subject in depth in future issues of Zero Retries.

My big project for next week - get that Thank You card sent off to Representative Debbie Lesko.

73,

Steve N8GNJ

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FCC Removes Symbol Rate Limitations on US Amateur Radio HF Bands

By Steve Stroh N8GNJ

... But symbol rate limitations remain in place, for now, for the US Amateur Radio LF and VHF / UHF bands.

Disclaimer 1: *As I've regularly encountered in attempting to cover this issue, I lack detailed "domain" knowledge of the processes, procedures, rules, even the traditions of the FCC. ("Communications Law" - dealing with the FCC, is a specialty practice of law, so I don't feel*

too bad for my lack of knowledge in this area.) I do my best, but I may misstate things or gloss over nuances and legalities in articles such as this. I welcome corrections and suggestions when / if I get something wrong, or incomplete, to the point that a followup or correction is merited.

Disclaimer 2: *In this article, I use Maximum Bandwidth and Channel / Channel Size somewhat interchangeably. The two terms are not quite equivalent - Maximum Bandwidth is the maximum channel size allowed; channel size is what a particular system is designed to use. At least that's the way I'm using it here.*

For a while, US Amateur Radio was poised for a brief moment of national recognition as a modification of FCC regulations for Amateur Radio was an item to be voted upon at the FCC's 2023-11-15 **Public Meeting**. As late as 2023-11-08, this discussion and vote [was an item on the agenda](#) for the FCC's 2023-11-15 Public Meeting.

On 2023-11-13 (two days prior to the FCC Public Meeting), the FCC voted (reportedly, unanimously) to [implement the proposed changes \(Report and Order\) to the US Amateur Radio regulations \(Part 97\)](#):

The Commission adopts this R&O and FNPRM to eliminate the baud rate limitation and establish a bandwidth limitation in certain amateur bands. The item also proposes removal of the baud rate limitation in several additional bands.

Thus there was no longer a need to discuss Amateur Radio at the Public Meeting. If you look at the (revised — note the asterisks on the fifth and sixth items) agenda, the FCC had some weighty issues to be discussed and voted upon. I watched the [video feed of the meeting](#) for a bit and the lead item — Preventing Digital Discrimination - was particularly contentious.

Credit Where Due to ARRL

When I wrote **The Annual Pactor 4 Hurricane Ritual** in Zero Retries 0066 on 2023-09-30, I concluded that discussion with:

C'mon, ARRL... if you really represent US Amateur Radio... get this DONE!

In Zero Retries 0114 on 2023-09-01 - Instructive Exchange Between Representative and FCC Chair, I wrote:

... I found it... hopeful... that there is direct recognition of Amateur Radio by at least FCC Chairperson Rosenworcel and FCC Commissioner Simington. In particular, it was instructive that Simington acknowledged that he had been contacted by (individual?) Amateur Radio Operators about this issue, and he specifically mentioned ARRL.

So, credit where due, **ARRL got this done**.

In [ARRL Hails FCC Action to Remove Symbol Rate Restrictions](#), ARRL, in turn, offers credit where due to **Representative Debbie Lesko** for taking up this issue and... highlighting it to the FCC:

We thank Congresswoman [Debbie] Lesko (AZ-08) for her efforts on behalf of all Amateurs to get these restrictions removed.

Not *Quite* Done...

This action (Report and Order) isn't quite done as of this moment:

IT IS FURTHER ORDERED that part 97 of the Commission's Rules IS AMENDED as set forth in the Appendix, effective 30 days after publication in the Federal Register.

So, presumably, but the end of 2023, the US HF bands will be finally safe for the unconditional use of Pactor 4 and the performance art of The Annual Pactor 4 Hurricane Ritual will no longer be necessary.

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***Next Up* - Removing Symbol Rate Limitations on the US Amateur Radio VHF and UHF Bands; the FCC Requests Comments**

In the [REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING](#) beginning on Page 9:

IV. FURTHER NOTICE OF PROPOSED RULEMAKING

20. There are multiple bands in the amateur radio service that have baud rate limitations and were not discussed in the NPRM. Two bands—135.7–137.8 kHz (2200 meter) and 472–479 kHz (630 meter) — were allocated for use in the amateur radio service after the Commission released the NPRM in 2016. There are also multiple very high frequency (VHF) bands (70)¹ and one ultra-high frequency (UHF) band (71)² that have baud rate limitations. In this Further Notice of Proposed Rulemaking (FNPRM) we propose to remove the baud rate limitation in the two bands allocated for amateur radio use after the Commission released the NPRM in 2016 and in the VHF/UHF bands. Additionally, we seek comment on the appropriate bandwidth limitation for the 2200 meter and 630 meter bands, and propose to maintain the existing bandwidth limitations in the Commission's rules for VHF/UHF bands. (72)³

21. In 2016, the Commission released the NPRM seeking comment on eliminating the baud rate limit in certain amateur bands and amending part 97 of the Commission's rules accordingly. (73)⁴ The NPRM also tentatively concluded that a 2.8 kilohertz bandwidth limitation for RTTY and data emissions in the MF/HF bands was not necessary, but sought comment on this conclusion. (74)⁵ The NPRM did not seek comment on eliminating the baud rate limit in the VHF or UHF bands allocated for amateur radio service. In 2017, the Commission adopted

rules permitting fixed amateur radio operations in 135.7–137.8 kHz (2200 meter) and 472–479 kHz (630 meter) bands. (75)[6](#) These bands are allocated to the amateur radio service on a secondary basis. (76)[7](#) Consistent with the part 97 rules in effect for other amateur bands at that time, the Commission adopted a 300 baud rate limitation for both the 2200 meter band and the 630 meter band. (77)[8](#)

22. For the reasons outlined in the Report and Order adopted today, we tentatively conclude that we should eliminate the baud rate limitation in the 2200 meter and 630 meter bands as well as the VHF and UHF amateur radio bands. These bands present the same technological opportunities for experimentation and innovation as the amateur radio service bands that are the subject of the Report and Order and likewise will be limited if a baud rate limitation is allowed to remain for these bands.

Concomitantly, we seek comment on the appropriate bandwidth limitation for the 2200 meter band and the 630 meter band as well as on maintaining the bandwidth limitations already in the VHF and UHF bands. We specifically seek comment on these proposals. Alternatively, should we consider changing any of the existing bandwidth limitations in the VHF and UHF bands allocated to the amateur radio service? (78)[9](#) Commenters seeking to modify existing bandwidth limitations must provide support for the modification, including any associated costs and benefits. Commenters should focus their comments on the VHF and UHF bands and the 2200 meter band and the 630 meter band that were allocated for amateur radio service after the release of the NPRM. We do not seek comment on other, unrelated issues in the docket at this time.

Initial Thoughts and Recommendation for the 2200 Meter and 630 Meter Bands

The US Amateur Radio [Low Frequency \(LF\)](#) — 135.7 – 137.8 kHz (2200 meter) and [Medium Frequency \(MF\)](#) band — 472 – 479 kHz (630 meter) bands, at 2.1 kHz wide and 7 kHz wide respectively are obviously a poor fit for the 2.8 kHz bandwidth limit that the FCC implemented in the HF bands. It's still appropriate to remove the symbol rate limitation on these bands - why restrict technological innovation with regulations appropriate for the era of the mechanical teletype? But what is an appropriate Maximum Bandwidth limit (if any) to implement on these unique, narrow bands? I confess I don't have any ideas (and suggestion to the FCC) other than, tentatively:

Recommendation for the 2200 meter and 630 meter bands:

Remove the symbol rate limitations on the 2200 meter and 630 meter bands. Symbol rate limitations were appropriate for data communications technology of earlier eras, but now limit the advancement of new data communications technology that's possible for Amateur Radio in the 21st century.

I'm gratified that the FCC had the foresight... and I think a very good perspective on... the *politics*[10](#)... of US Amateur Radio to essentially *force the issue* of reconsidering symbol rates and bandwidth limitations on the US Amateur Radio VHF / UHF bands[11](#):

These bands present the same technological opportunities for experimentation and innovation as the amateur radio service bands that are the subject of the Report and Order and likewise will be limited if a baud rate limitation is allowed to remain for these bands.

If the FCC had not had that foresight, I doubt this issue would... *could*... have been addressed in the foreseeable future. But they did, and now we have a chance to reshape the US Amateur Radio VHF / UHF bands.

Status of US Amateur Radio VHF / UHF bands - Maximum Symbol Rate and Maximum Bandwidth

Here is the status of the US Amateur Radio VHF / UHF bands, related to current symbol rate and maximum bandwidth for data communications, as I understand it. The Maximum Symbol Rate is shown as ~~strike through~~ as the FCC proposes to eliminate that, as they did for the HF bands.

50 - 54 MHz (6 meters)

~~Maximum Symbol Rate—19.6 kilobauds~~

Maximum channel size (bandwidth) - 20 kHz

144-148 MHz (2 meters)

~~Maximum Symbol Rate—19.6 kilobauds~~

Maximum channel size (bandwidth) - 20 kHz

219 - 220 MHz (1.25 meters)

There is no maximum symbol rate limitation for this band.

Maximum channel size (bandwidth) - 100 kHz

222 - 225 MHz (1.25 meters)

~~Maximum Symbol Rate—56 kilobauds~~

Maximum channel size (bandwidth) - 100 kHz

420 - 450 MHz (70 centimeters)

~~Maximum Symbol Rate—56 kilobauds~~

Maximum channel size (bandwidth) - 100 kHz

(Bands above 450 MHz don't appear to have maximum symbol rates or maximum channel size limitations.)

Per the FCC's statement:

Commenters seeking to modify existing bandwidth limitations must provide support for the modification, including any associated costs and benefits.
Commenters should focus their comments on the VHF and UHF bands...

The following are my initial / current thoughts for the FCC (and Zero Retries readers).

Initial Thoughts and Recommendation on Revising Maximum Bandwidth in the US

Amateur Radio VHF / UHF Bands - 6 Meters and 2 Meters

In a more perfect world, I would recommend revising the Maximum Bandwidth of 6 meters and 2 meters to perhaps 50 kHz to provide for greater experimentation with digital communications. For example, there has been marvelous progress in digital video modes that only require a small fraction of the 6 MHz bandwidth that legacy analog television required. Digital video (more advanced than Slow Scan television) would be a lot of fun on 2 meters. (I only mention this mode as one example.)

But, with my perspective of 35+ years as a US Amateur Radio Operator, such a suggestion would trigger massive... “*counter suggestions*” and the bigger gains that are possible (see below) would be drowned out. Thus, my recommendation to the FCC is, tentatively:

Recommendation for the 50-54 MHz (6 meter) and 144-148 MHz (2 meter) bands:

Remove the symbol rate limitations on the 6 meter and 2 meter bands. Symbol rate limitations were appropriate for data communications technology of earlier eras, but now limit the advancement of new data communications technology that’s possible for Amateur Radio in the 21st century.

The 6 meter band shares some properties of HF bands (long range when ionospheric conditions are ideal) and VHF / UHF bands (line of sight, but longer range than is possible with higher frequencies). Thus, revising the Maximum Bandwidth for 6 meters (from the current 20 kHz) would be too disruptive.

The 2 meter band is US Amateur Radio’s most heavily used VHF / UHF band. From long tradition, the 2 meter band is used almost entirely for repeater operation. Thus revising the Maximum Bandwidth from the current 20 kHz) for 2 meters would be too disruptive.

In these two bands, increasing technological innovation and advancement of data communications technology would be well-served by eliminating Symbol Rate limitations.

Initial Thoughts and Recommendation on Revising Maximum Bandwidth in the US Amateur Radio VHF / UHF Bands - 219-220 MHz

The 219-220 MHz band has a number of unique regulatory aspects and is Zero Retries Interesting (see below) enough that I wrote a previous article about it in **Zero Retries 0053** - US 219-220 MHz Band. The regulatory aspect most germane to this discussion is:

Use is restricted to amateur stations participating as forwarding stations in fixed point-to-point digital message forwarding systems, including intercity packet backbone networks. It is not available for other purposes.

When building point-to-point radio links, it’s possible to use omnidirectional antennas, but if your goal is maximizing performance in a point-to-point link, typically, you would use [highly directional antennas](#).

Because of that, there’s little issue with “sharing” the band (your transmitted signal is intended only for the other end of the link) and thus there’s a case to be made for using the entire 1 MHz

of the band if it's expedient to do so.

Thus, I believe is reasonable to consider removing the 100 kHz Maximum Bandwidth limitation of the 219-220 band because of the demonstrated capabilities of an advanced data communications system designed and built for Amateur Radio - [New Packet Radio \(NPR\)](#). As I discussed in **Zero Retries 0118 - When I Get Something Wrong - New Packet Radio Data Rate and Channel Size**, NPR is (currently) designed to operate in the Amateur Radio 420-450 MHz (430 MHz) band in a number of different data communications speeds / modes. In the US, NPR is limited to 100 kbps because that is the only mode that is compatible with the current Maximum Bandwidth in 420-450 MHz of 100 kHz. But if the Maximum Bandwidth was at least 1 MHz (as is the case in other countries), then the fastest mode of NPR can be used - a data rate of 1 Mbps.

The non-regulatory aspects of the 219-220 MHz band, such as this band being a secondary allocation to Amateur Radio and good Amateur Radio practice is to “don't get the primary users mad at you”, it seems to me that there is little danger of interference issues if the entire 1 MHz of 219-220 MHz is used for a point-to-point link. Thus, my recommendation to the FCC is, tentatively:

Recommendation for the 219-220 MHz (1.25 meter) sub-band:

Technological innovation and advancement of data communications technology in Amateur Radio would be served by removing the 100 kHz Maximum Bandwidth limitation from the 219-220 MHz band. This would allow, potentially, the entire 1 MHz of this band to be used by a single pair of stations in a point-to-point link.

An example of the utility of such a change is the example of New Packet Radio (NPR) (<https://hackaday.io/project/164092-npr-new-packet-radio>) which is a data communications system designed by, and built for Amateur Radio Operators. NPR offers a number of different modes and data communications speeds. Using a 100 kHz channel, NPR's data rate is 100 kbps. *Using a 1 MHz channel, NPR's data rate is **1 Mbps**.*

Good engineering (and Amateur Radio) practice is that a point-to-point link (the only allowed Amateur Radio use of 219-220 MHz) be designed to maximize the capacity of the link, but also limit the transmission power and bandwidth to only what is required to reliably communicate with the other end of the link. Thus “using the entire band” is of little or no concern when the only use of 219-220 MHz is a series of point-to-point links.

I recommend that in **§97.305 Authorized emission types, 1.25 m 219-220 MHz**, that the reference to §97.307(f), (13) which states:

(13) A data emission using an unspecified digital code under the limitations listed in §97.309(b) also may be transmitted. The authorized bandwidth is 100 kHz.

be removed. This will effectively allow Maximum Bandwidth of 1 MHz to be used in a point-to-point link in 219-220 MHz.

Initial Thoughts and Recommendation on Revising Maximum Bandwidth in the US Amateur Radio VHF / UHF Bands - 222-225 MHz

The 222-225 MHz band is only 3 MHz, and in some areas of the US, it is used extensively for repeaters. In other areas of the US, it's lightly used. The current Maximum Bandwidth for 222-225 MHz is, like 219-220 MHz, 100 kHz.

Leaning again on my perspective of 35+ years as a US Amateur Radio Operator, and living in the Pacific Northwest where 222-225 MHz is actually used pretty thoroughly for repeaters, my sense is that seeking an increase beyond the current Maximum Bandwidth of 100 kHz would also trigger *some* (if not "massive") "counter suggestions" and the bigger gains that are possible (see below) would be drowned out. Thus, my recommendation to the FCC is, tentatively:

Recommendation for the 222-225 MHz (1.25 meter) band:

Remove the symbol rate limitations on the 1.25 meter band. Symbol rate limitations were appropriate for data communications technology of earlier eras, but now limit the advancement of new data communications technology that's possible for Amateur Radio in the 21st century.

When the 3 MHz size (222-225 MHz) of the 1.25 meter band is considered, retaining the current Maximum Bandwidth of 100 kHz is both non-disruptive and, with the removal of symbol rate limitations, provides adequate bandwidth for increasing technological innovation and advancement of data communications technology.

Initial Thoughts and Recommendation on Revising Maximum Bandwidth in the US Amateur Radio VHF / UHF Bands - 420-450 MHz

This... is the [big kahuna](#) in the consideration of revising the Maximum Bandwidth for the Amateur Radio VHF / UHF bands.

There are two competing paradigms about Maximum Bandwidth in the 420-450 MHz band:

- For data, a limitation of Maximum Bandwidth of 100 kHz for data,
- For legacy analog television (NTSC), the traditional use of a 6 MHz channel is considered acceptable and legal^{[12](#)}.

It has always been absurd to me, and to many others interested in data communications in Amateur Radio, that data communications on 420-450 MHz was limited to a 100 kHz channel when the use of a 60x larger channel "for television" is obviously acceptable in 420-450 MHz... as long as you can make a case that your use of a 6 MHz channel is "television". It's long been joked about that it could be justified to use a 6 MHz channel for data communications as long as the data stream being transmitted included a moving image, thus allowing the 6 MHz channel usage to be called "television".

Yet again leaning again on my perspective of 35+ years as a US Amateur Radio Operator, I'm a bit torn about the expediency of a "minor tweak" of changing the Maximum Bandwidth in 420-450 MHz from 100 kHz to 1 MHz (matching much of the rest of the world's usage of this Amateur Radio band^{[13](#)}) and trying to go for maximum flexibility of codifying the longstanding use of 6 MHz channels for legacy analog television and adding the flexibility of data communications being accorded the same channel size. Thus *this* recommendation to the FCC is more of a work in progress than the previous recommendations:

Recommendation for the 420-450 MHz (70 centimeter) band:

Remove the symbol rate limitations on the 70 centimeter band. Symbol rate limitations were appropriate for data communications technology of earlier eras, but now limit the advancement of new data communications technology that's possible for Amateur Radio in the 21st century.

When the 30 MHz size (420-450 MHz - South of Line A, the majority of the US) of the 70 centimeter band is considered, there is ample spectrum to allow a larger Maximum Bandwidth than the current 100 kHz.

Minimum proposal - 1 MHz: Replace the current Maximum Bandwidth of 100 kHz with a Maximum Bandwidth of 1 MHz.

An example of the utility of such a change is the example of New Packet Radio (NPR) (<https://hackaday.io/project/164092-npr-new-packet-radio>) which is a data communications system designed by, and built for Amateur Radio Operators. NPR offers a number of different modes and data communications speeds. Using a 100 kHz channel, NPR's data rate is 100 kbps. *Using a 1 MHz channel, NPR's data rate is **1 Mbps**.*

Alternative (Preferred) Proposal - 6 MHz: Alternatively, the Commission should consider the longstanding usage of 6 MHz channels in the 70 centimeter band for transmission of legacy analog television signals. Although it's technically challenging, it's even possible for two 6 MHz channels be used in the 70 centimeter band, in the same area, for television repeaters. One 6 MHz channel is used for the repeater input (uplink) and another 6 MHz channel is used for the repeater output (downlink). This longstanding practice of the use of 6 MHz channels amply demonstrates that there are no adverse effects in the 70 centimeter band from usage of 6 MHz channels, primarily because good Amateur Radio practice and desire for non-interference and equitable sharing of the 70 centimeter band. Thus, the Commission should consider revising the Maximum Bandwidth for the 70 centimeter band from 100 kHz to 6 MHz.

It's reasonable to extrapolate that a future variant of the New Packet Radio system could achieve 6x the data rate - 6 Mbps if a 6 MHz channel is used instead of the current maximum channel size of 1 MHz. This is just a minimal example of the potential for Amateur Radio to experiment with faster data communications technology if increased regulatory flexibility for such experimentation is permitted by the FCC. A more current, technologically advanced example of what could be done in Amateur Radio if a 6 MHz channel is permitted for data communications is the use of television white space (TVWS) technology that is currently used in unused television broadcast spectrum to provide broadband Internet access in rural areas. Amateur Radio Operators have a long history of adapting expensive technology systems such as TVWS for Amateur Radio, for wider use at lower prices. The requirement for use of TVWS technology in Amateur is the use of a 6 MHz channel where data communications, not just "image communications" is permitted.

Submitting Comments on the Further Notice of Proposed Rulemaking

As I write this, I do not know what the formal procedure for submitting comments on a *Further* Notice of Proposed Rulemaking. Without question there is such a procedure, and as with previous Notice(s) of Proposed Rulemaking, the procedure is largely cutting and pasting a

boilerplate form, adding your comments, and sending it in per the instructions, within the time limits allowed by the FCC.

The biggest issue with submitting comments is adding *light* to the discussion, not *heat*. Your technical arguments are germane to the FCC; your opinions about how the FCC operates... are not.

As I said, this subject will be continued in future issues of Zero Retries, including the mechanics of sending in one's comments to the FCC (likely next issue as I do a bit of research on the subject).

Thanks for your attention if you've read this far.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

(Apologies for the short shrift of ZR > BEACON this issue. I know that ZR > BEACON is the favorite feature of many readers. ZR > BEACON will be back, in full force, next issue.)

[Wireless Spectrum Finder - Available Online](#)

On my nearest shelf of books is a book called **Wireless Spectrum Finder**. In my odd writing career which began writing about Wireless Internet Service Providers in the late 1990s, WSF proved to be an invaluable reference. It's content is unique - no other reference provides a "guided tour" of the electromagnetic spectrum like Wireless Spectrum Finder. The author of WSF is Bennet Z. Kobb AK4AV, whose current writing project is [Experimental Radio News](#) (highly recommended) into which he pours the same expertise and passion that he put into Wireless Spectrum Finder. WSF is now a bit dated, and long out of print. I'm loathe to donate my copy of WSF (I trust them... I just love having WSF near me in book form) for digitizing into [Digital Library of Amateur Radio & Communications \(DLARC\)](#). In a recent need of a quick reference point, I thought to check DLARC for a copy, and to my delight, Wireless Spectrum Finder is *already available there*! Now it's in digital form, keyword searchable!

[Kay Savetz K6KJN on QSO Today Podcast](#)

Speaking of DLARC, and Zero Retries Interesting, Kay Savetz K6KJN, Program Manager, Special Collections, Internet Archive (DLARC) was a recent guest on the QSO Today Podcast.

Kay Savetz, K6KJN, followed his father, Steve, into amateur radio when he

entered college and Journalism school at the beginning of the Atari computer age. Tech journalism is Kay's profession leading him to be the technical historian specializing in amateur radio and communications at the Internet Archive. We deep dive into Kay's interest in amateur radio, technology and communications history, and the Atari 8 bit computers in this QSO Today.

K6KJN's interview adds to my *considerable backlog* of Zero Retries Interesting episodes of QSO Today to listen to; I may have to increase the lengths of my walks to catch up.

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Feedback Loop

Comments on Zero Retries 0124 (and my pithy and clever replies).

My thanks to Tom Salzer, Ben Kuhn, Ren Roderick, and ReadyKilowatt for their interesting comments.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT
 - Founding Member 0001 - Prefers to Remain Anonymous 01
 - Founding Member 0002 - Chris Osburn KD7DVD

Founding Member 0003 - Don Rotolo N2IRZ
Founding Member 0004 - William Arcand W1WRA
Founding Member 0005 - Ben Kuhn KU0HN
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Founding Member 0007 - Merik Karman VK2MKZ
Founding Member 0008 - Prefers to Remain Anonymous 14

- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:

<https://www.zeroretries.org>

- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

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Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2023-11-17

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[1](#)

Footnote from FCC document FCC 23-93: 6 meter band (50.1–51.0 MHz), (51.0–54.0 MHz); 2 meter band (144.1–148.0 MHz); 1.25 meter band (222–225 MHz). 47 CFR § 97.305(c).

[2](#)

Footnote from FCC document FCC 23-93: 70 centimeter band (420–450 MHz). 47 CFR § 97.305(c).

[3](#)

Footnote from FCC document FCC 23-93: 47 CFR § 97.307(f)(5)–(6).

[4](#)

Footnote from FCC document FCC 23-93: NPRM, 31 FCC Rcd 8485.

[5](#)

Footnote from FCC document FCC 23-93: Id. at 8489, para 10.

[6](#)

Footnote from FCC document FCC 23-93: See WRC-12 R&O, 32 FCC Rcd at 2708, para. 13.

[7](#)

Footnote from FCC document FCC 23-93: Id.

[8](#)

Footnote from FCC document FCC 23-93: 47 CFR § 97.305; 47 CFR § 97.303(f)(3).

[9](#)

Footnote from FCC document FCC 23-93: See, e.g., Letter from David R. Siddall, Counsel to ARRL, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 16-239, at 1 (filed on Nov. 8, 2023) (requesting that the Commission seek comment on changing the 100 kHz bandwidth

limitation in the 219–220 MHz segment of the 1.25 meter VHF band, which does not have a baud rate limitation).

[10](#)

Unfortunately, I cannot think of any better, more impartial, way to phrase this situation.

[11](#)

It's probably boring and some would consider it unnecessary to keep repeating that this issue is specific to the **US** Amateur Radio VHF / UHF bands, but other countries don't have this limitation on *their* Amateur Radio VHF / UHF bands, and I try to write Zero Retries for an International audience.

[12](#)

I spent approximately one hour combing through an FCC Part 97 document trying to find a mention that it's permissible to use a 6 Mz channel for legacy analog television... and could not find such a specific reference. The closest I could find was

§97.307 *Emission standards.*

(a) No amateur station transmission shall occupy more bandwidth than necessary for the information rate and emission type being transmitted, in accordance with good amateur practice.

Thus, I can only conclude that given that legacy analog television requires a minimum 6 MHz channel, and the lowest US Amateur Radio band that can accommodate a 6 MHz channel is 420-450 MHz, ipso facto, the use of a 6 MHz channel is allowed per §97.307.

[13](#)

There are many international variations of the “420-450 MHz” band, such as 430-440 MHz in the UK.